REMARKS

This Amendment is in response to the Office Action mailed on June 5, 2002. Claims 2, 4-7, 9-16, 18, 20, 21 and 23-27 are pending in the application and were rejected. Applicants hereby respond to the issues raised in the Office Action as follows.

Response to drawing objections

The drawings were objected to under 37 CFR § 1.83(a) on the basis that they do not show every feature of the invention as specified in the claims. The drawings and specification have been amended to clarify the structure corresponding to the recited limitations in the claims which is fully supported by the specification. In particular, Applicants' specification states that an air bearing surface of the slider/glide head includes contoured portions such as rails for aerodynamic performance. Page 7, lines 19-21. As shown in FIG. 7, rails form raised bearing surfaces 403-1, 403-2 elevated above a recessed surface 404. As described, thermal transducers 500 are located on raised bearing surfaces as shown in FIG. 9 of the rails 506 or other contoured surface. The thermal transducers 500, as shown in FIG. 9, include a surface portion 509 extending along a portion of the raised bearing surface 508 and a thickness portion 514 as illustrated in FIG. 10. Based upon the foregoing, Applicants respectfully request that the objection to the drawings under 37 CFR § 1.83(a) be withdrawn.

Response to objections to the specification

The disclosure was objected to on the basis of several informalities. Applicants have amended the specification to clarify the structure corresponding to the recited claim limitations. In particular, *inter alia* page 13 has been amended to recite raised bearing surfaces 403-1, 403-2 as shown in FIG. 7 which are elevated above surface 404. Also, page 14 has been amended to recite a thermal transducer 500 formed on raised

bearing surface 508 to form a surface portion 509 extending along a portion of the raised bearing surface 508 and a thickness portion 514 as illustrated in FIG. 10.

As described in Applicants' specification on Page 8, lines 29-31, an embodiment of a glide head/slider 132 is depicted in FIG. 2. As amended, Applicants' specification recites that the glide head/slider 132 includes a glide body 131 and two rails 150, 152 on air bearing surface 154 (Applicants' specification, page 8, lines 30-31). Applicants have also amended Page 14, line 3 to recite "or glide heads" to clarify the recited claim language. Reconsideration and withdrawal of the objections to the specification are respectfully requested.

Response to claim rejections - 35 U.S.C. § 112

Claims 2, 4-7, 9-15 and 23-24 were rejected under 35 U.S.C. § 112, First Paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains to make or use the invention. In particular, claims 2, 4-7, 9-15 and 23-24 were rejected on the basis of the term "a thickness portion intersecting". As described, Applicants' specification discloses a thermal transducer formed on raised bearing surface 403-1, 403-2 of amended FIG. 7 and raised bearing surface 508 of FIG. 9. As shown in FIG. 9, the thermal transducers 500 include a surface portion 509 extending along a portion of the raised bearing surface 508 or rail 506 and a thickness portion 514 as illustrated in FIG. 10 generally intersecting the surface portion 508 as illustrated in FIGS. 2-9 of Applicants' specification. Based upon the foregoing, reconsideration and withdrawal of the rejection of claims 2, 4-7, 9-15 and 23-24 under 35 U.S.C. § 112, First Paragraph, are respectfully requested.

Claims 2, 4-6, 9-15 and 23-24 were rejected under 35 U.S.C. § 112, Second Paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter

which Applicants regard as the invention on the basis of the term "a thickness portion intersecting..." and thus how a glide interface is formed. As described in Applicants' specification, thermal transducers are formed on the raised bearing surface or rail to provide a contact surface portion 509 as illustrated in FIG. 9 and a thickness portion 514 as illustrated in FIG. 10. Thermal transducers placed on the raised bearing surface provide a contact surface 509 or a contact interface along the raised bearing surface to increase the contact area for detecting asperities. (Applicants' specification, Page 7, lines 21-24, Page 14, line 30 et seq.). Based upon the foregoing, reconsideration and withdrawal of rejection of the claims under 35 U.S.C. § 112, Second Paragraph are respectfully requested.

Claim 16 was rejected under 35 U.S.C. § 112, Second Paragraph, as being incomplete for omitting an essential structural cooperative relationships of elements. Claim 16 has been amended to recite fabricating an air bearing surface including a raised bearing surface and a recessed bearing surface to cooperatively form the air bearing surface of the slider/glide head. Reconsideration and withdrawal of the rejection of claim 16 under 35 U.S.C. § 112, Second Paragraph, are respectfully requested.

Response to claim rejections - 35 U.S.C. § 103

Claims 2, 4-6, 9-11, 14-16, 23, 25 and 27 were rejected under 35 U.S.C. § 103(a)as being unpatentable over Boutaghou, U.S. Patent No. 5,808,184 on the basis that Boutaghou discloses MR sensors spaced along the length of rails 26 of the air bearing surface 14.

Claims 2-4, 6, 9-11, 14-15 and 23 recite *inter alia* at least one thermal transducer formed on the raised bearing surface having a surface portion extending along a portion of the raised bearing surface and a thickness portion intersecting the surface portion which provides desired contact area for asperity

detection. As quoted by the Examiner on Page 5 of the Office Action, MR heads fabricated by known techniques by deposition of a very thin, as known in the art, Column 4, lines 8-9, layers provide a thin flat (Column 7, line 20) asperity contacting surface oriented along the air bearing surface. In contrast, the present invention relates to a thermal transducer formed on the raised bearing surface having a surface portion extending along the raised bearing surface to provide a relatively large contact area to contact thermal asperities and a thickness portion oriented as shown in FIG. 10.

As recited in the Office Action, the Examiner relies on the statement that during the fabrication process, portions of the rails act as substrates 28 upon which the sensor layers are deposited. As described in Applicants' specification, MR sensor formed along a side or leading edge of the slider or rails having an edge or thin portion oriented along the air bearing surface do not provide a desired contact interface. (Applicants' specification, page 5, line 1 et seq). As described in Applicants' specification, the surface portion 509 formed along the raised bearing surface provides a larger contact or detection area in contrast to prior art structures having a very **thin portion** or layer oriented along the air bearing surface forming the asperity contacting surface.

For example magnetoresistive (MR) sensors in read/write heads formed on a trailing edge of the slider body having only an edge or thickness portion of the MR sensor oriented along the air bearing or raised bearing surface provide only a thin surface area for asperity contact. In contrast, a thermal transducer formed on the raised bearing surface having a surface portion 509 (and not thickness portion 514) oriented along the raised bearing surface provides a larger contact interface for thermal asperity detection. Based upon the foregoing, reconsideration and allowance of the rejected claims are respectfully requested.

Claim 16 recites the steps of fabricating an air bearing surface and depositing a thermal transducer on the raised bearing surface. Claim 16 was rejected on the basis that since the rails are formed on an air bearing surface (FIG. 2) inherently, it is expected that the air bearing surface is configured prior to the deposition process. As described in Boutaghou, MR sensors 18 are fabricated at the wafer level using well-known MR element fabrication techniques. As described in Applicants' specification, in conventional approaches, the air bearing surface is formed **after** slicing the wafer to form a slider bar. (Applicants' specification Page 13, lines 30-32). Thus, it is not inherently expected that the ABS is configured prior to the deposition process for MR sensors fabricated at the wafer level. Furthermore, it is not inherent that the thickness of the transducers intersects a portion extending along the air bearing surface for MR sensors having layers deposited on a trailing edge surface providing a thin, flat thickness asperity contacting surface oriented along the air bearing surface as described above. Thus, the basis for the Examiner's rejection is not supported and should be withdrawn.

Claim 25 recites *inter alia* a glide head including an asperity detection means on the glide body for detecting asperities on a disc surface. Means-plus-function language in a claim is interpreted to include the structure disclosed in Applicants' specification and equivalents. Applicants' specification discloses a thermal transducer formed on raised bearing surfaces as illustrated in FIGS. 2-9 which is not taught nor suggested by the cited references. Claim 27 recites a head having a body portion including a raised bearing surface and at least one thermal transducer formed on the raised bearing surface which, as previously discussed, is not taught nor suggested by Boutaghou.

Claims 18 and 21 were rejected under 35 U.S.C. § 103 as being unpatentable over Boutaghou in view of Yura, U.S. Patent No. 5,177,860. Claims 18 and 21 recite slicing glide bodies from a wafer and depositing a thermal transducer on the plurality of glide bodies sliced from the wafers. Claims 18 and 21 were rejected on the basis that "Yura discloses a method of manufacturing glide heads comprising cutting the slider wafer 1 into individual sliders. However, each element of the claims must be considered including the process step of **depositing thermal transducers on the plurality of glide bodies <u>sliced</u> from the wafer**. Boutaghou discloses at Column 3, lines 20-23 fabricating MR sensors at the wafer level, (i.e. depositing thermal transducers before sliced from the wafer). Yura discloses a manufacturing method including the steps of depositing transducer elements on a wafer and slicing the wafer to form individual sliders (i.e. depositing thermal transducers before sliced from the wafer) and thus neither reference, alone nor in combination, teaches nor suggests the subject matter claimed.

Claim 26 was rejected under 35 U.S.C. § 103 as being unpatentable over Boutaghou as applied to claims 2, 4-6, 9-11, 14-16, 23, 25 and 27 above and further in view of Yura on the basis that Boutaghou "does not explicitly disclose depositing thermal transducers <u>prior</u> to slicing a wafer - however it is noted that Column 3, lines 20-23 recite MR sensors fabricated at the wafer level. Claim 26 is dependent on claim 16 and further recites the step of fabricating the raised bearing surface and recessed bearing surface and depositing a thermal transducer prior to slicing glide heads from the wafer. Yura discloses a manufacturing method for depositing magnetic poles 21 and coils 22 in a silicon wafer structure through photolithography but does not teach nor suggest fabricating a raised bearing surface and a recessed bearing surface and depositing thermal transducers at

the wafer level on the raised bearing surface prior to slicing glide heads from the wafer. Thus, there is no teaching or suggestion to modify Boutaghou in view of Yura for fabricating thermal sensors as claimed. Reconsideration and allowance of claim 26 are respectfully requested.

Claim 7 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Boutaghou as applied to claims 2, 4, 6, 9-11, 14-16, 23, 25 and 27 and further in view of Padovani, U.S. Patent No. 5,372,427. Claim 7 is dependent on claim 1 which, as previously discussed, is not taught nor suggested by Boutaghou nor the further combination of Padovani. Accordingly, reconsideration and withdrawal of the rejection of claim 7 is respectfully requested.

Claim 12 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Boutaghou as applied to claims 2, 4-6, 9-11, 14-16, 23, 25 and 27 above and further in view of Flechsig. Claim 12 is dependent upon claim 1 and is not taught nor suggested by Boutaghou nor the further combination of Flechsig.

Claim 20 was rejected under 35 U.S.C. § 103 as being unpatentable over Boutaghou as applied to claims 2, 4-6, 9-11, 14-16, 22, 23, 25 and 27 in view Nguyen. Claim 20 is dependent upon claim 16 which is not taught nor suggested by the combination of Boutaghou and Nguyen. Nguyen discloses a thin film transducer 28 along a trailing edge surface (see number 28) and thus, Nguyen does not teach nor suggest the subject matter of claim 20 including the steps of fabricating a raised bearing surface and depositing a thermal transducer on the raised bearing surface.

Claim 24 was rejected under 35 U.S.C. § 103 as being unpatentable over Boutaghou as applied to claims 2, 4-6, 9-11, 14-16, 22, 23, 25 and 27 above in view of Ishimaga, U.S. Patent No. 6,234,599. Claim 24 is dependent upon claim 2 which is not

taught nor suggested by Boutaghou nor the further combination Ishimaga.

Based upon the foregoing, reconsideration and allowance of the pending claims are respectfully requested. Any inquiry regarding this document should be directed to the undersigned attorney of record.

The Director is authorized to charge any fee deficiency required by this paper or credit any overpayment to Deposit Account No. 23-1123.

Respectfully submitted,

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MARKED UP VERSION OF REPLACEMENT PARAGRAPHS

Page 8, line 29 through Page 9, line 10:

An embodiment of a glide head/slider 132 is depicted in Fig. 2. Glide head 132 includes a glide body 131 and two rails 150, 152 on air bearing surface 154. A thermal transducer 156 is located on rail 150. Thermal transducer 156 is located near rear edge 158 of glide head 132. Electrically conducting pads 160, 162 electrical contact between thermal transducer 156 and the top of glide head 132. Pads 160, 162 are connected to a measurement circuit at the top of the glide head such that the electrical resistance of thermal transducer 156 can be monitored. To improve the aerodynamic performance, steps 164, 166 are located near front edge 168 of glide head 132. The contoured features on the air bearing surface can be varied to achieve a desired aerodynamic performance of the glide head.

Page 13, lines 3-16:

An embodiment of glide head 132 with different types of defect detecting transducers is depicted in Fig. 7. Glide head 132 includes rails 400, 402 along air bearing surface 404 which form raised bearing surfaces 403-1, 403-2 as shown in Fig. 7 which are elevated above surface 404. Thermal transducer 406 is located on rail 402 along the raised bearing surface 403-2. Electrically conductive pads 408, 410 provide electrical conduction between transducer 406 and the top surface 412 of glide head 132. Pads 408, 410 are connected to resistance measurement circuit 414 for the evaluation of changes in resistance of the transducer 406. Pads 408, 410 are located along or near rear edge 416 of glide head 132. Piezoelectric transducer 420 is located on wing 422 along top surface 412. Piezoelectric transducer 420 is connected to measurement circuit 424.

Page 13 line 29 through Page 14, line 3:

The order of processing depends on the approach used to produce the slider from a wafer. In conventional approaches, the air bearing surface is formed from a cut edge of the wafer. In these approaches, the electrically conductive pads can be deposited on the surface of the wafer prior to the slicing of the wafer. The pads are positioned on the wafer surface such that they are along the rear edge of the slider after or glide head the sliders are cut from the wafer.

Page 14, line 30 through Page 15, line 4:

To form the sliders with the thermal transducers located on the air bearing surface (e.g. raised bearing surfaces), a plurality of thermal transducers 500 can be applied along the smooth surface 502 of wafer 504, as shown in Fig. 8. Thermal transducers 500 are located or formed on the raised bearing surfaces 508 of rails 506 contoured onto surface 502 to form a surface portion 509 extending along a portion of the raised surface 508 of rail 506 and a thickness portion 514 as illustrated in Fig. 10. Representative rails 506 are noted in Fig. 8. Alternatively, as previously explained, thermal transducers 500 can be formed on the raised contoured surface or rails of the air bearing surface on a bar sliced from the wafer. As shown in FIG. 10, the thermal transducers 500 can be covered with a protective layer 516, such as diamond-like carbon. Additional transducers such as a piezoelectric transducer also can be placed on the opposite surface of the wafer prior to the slicing into individual sliders.

MARKED-UP VERSION OF REPLACEMENT CLAIMS

16. (Fifth Amended) A method of fabricating a glide head comprising:

fabricating an air bearing surface including a raised bearing surface and a recessed bearing surface; and

depositing a thermal transducer on the raised bearing surface to form a glide interference to detect asperities.